






7.2 Cell Structure

Lesson Objectives

-  Describe the structure and function of the cell nucleus.
-  Describe the role of vacuoles, lysosomes, and the cytoskeleton.
-  Identify the role of ribosomes, endoplasmic reticulum, and Golgi apparatus in making proteins.
-  Describe the function of the chloroplasts and mitochondria in the cell.
-  Describe the function of the cell membrane.

Lesson Summary

Cell Organization Eukaryotic cells contain a nucleus and many specialized structures.

- ▶ **Cytoplasm** is the fluid portion of a cell.
- ▶ **Organelles** are structures that have specialized functions in eukaryotic cells.
- ▶ The nucleus contains DNA and controls the activity of a cell.

Organelles That Store, Clean Up, and Support These structures include:

- ▶ **vacuoles:** membrane-enclosed saclike structures that store water, salts, and organic molecules
- ▶ **lysosomes:** small organelles filled with enzymes that break down large molecules and organelles that are no longer useful
- ▶ the **cytoskeleton:** a network of protein filaments; it helps the cell maintain its shape and is involved in movement
- ▶ **centrioles:** organelles made from tubulins; they help organize cell division in animal cells

Organelles That Build Proteins Three kinds of organelles work with the nucleus to make and distribute proteins:

- ▶ **ribosomes:** small particles of RNA and protein found throughout the cytoplasm in all cells; they produce proteins by following coded instructions from DNA
- ▶ the **endoplasmic reticulum (ER):** an internal membrane system where lipid components of the cell membrane are assembled, along with proteins and other materials
- ▶ the **Golgi apparatus:** an organelle that appears as a stack of flattened membranes; it modifies, sorts, and packages proteins and other materials from the ER for storage in the cell or release outside the cell

Organelles That Capture and Release Energy Two types of organelles act as power plants of the cells. Both types are surrounded by two membranes.

- ▶ **Chloroplasts** capture the energy from sunlight and convert it into food that contains chemical energy in a process called photosynthesis. Cells of plants and some other organisms contain chloroplasts, which contain chlorophyll.
- ▶ **Mitochondria** are found in nearly all eukaryotic cells; they convert the chemical energy stored in food to a usable form.

Cellular Boundaries All cells are surrounded by a cell membrane. Many cells also have a cell wall. Both cell membranes and cell walls separate cells from the environment and provide support.

- ▶ **Cell walls** support, shape, and protect the cell. Most prokaryotes and many eukaryotes have them. Animals do not have cell walls. Cell walls lie outside the cell membrane. Most cell walls allow materials to pass through them.
- ▶ A cell membrane consists of a **lipid bilayer**, a strong but flexible barrier between the cell and its surroundings. The cell membrane regulates what enters and leaves the cell and also protects and supports the cell. Most biological membranes are **selectively permeable**, allowing some substances, but not others, to pass across them.

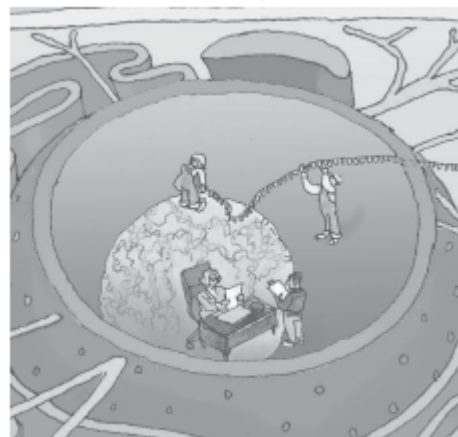
Cell Organization

1. Describe the relationship between the cytoplasm and the nucleus of a cell.

2. What does the term *organelle* mean literally?

For Questions 3–5, refer to the Visual Analogy comparing the cell with a factory.

3. **VISUAL ANALOGY** In the visual analogy of a cell as a factory, what two functions of the nucleus are represented? How are these functions illustrated?



4. Which feature of the nucleus is *not* clearly shown by the visual analogy?

5. What is another possible analogy that could be compared with the structure and function of a cell?

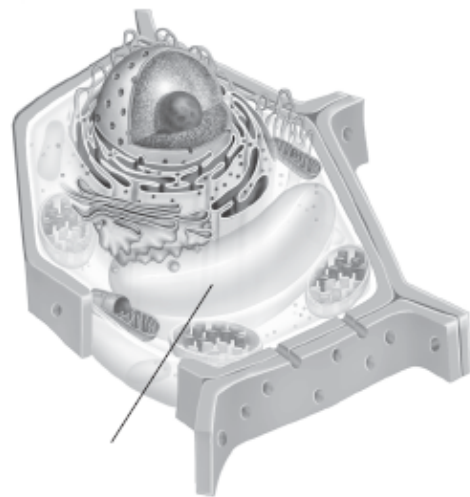
Organelles That Store, Clean Up, and Support

6. What are vacuoles?

7. What are the two roles of the central vacuole in plant cells?

8. How are contractile vacuoles different from other types of vacuoles?

9. In the diagrams of the animal cell and the plant cell, label the structures indicated by the lines.



10. What is the role of lysosomes in the cell? Why is this a vital role?

11. Which structures of the cytoskeleton are found in animal cells but not in plant cells?

12. What other structures of the cytoskeleton would show the same pattern of microtubules as a flagellum?

Organelles That Build Proteins

13. What are ribosomes? What do they do?

14. In which organelle are the lipid components of the cell membrane assembled?

15. What is the difference between rough ER and smooth ER?

16. Using the cell as a factory analogy, describe the role of the Golgi apparatus in cells.

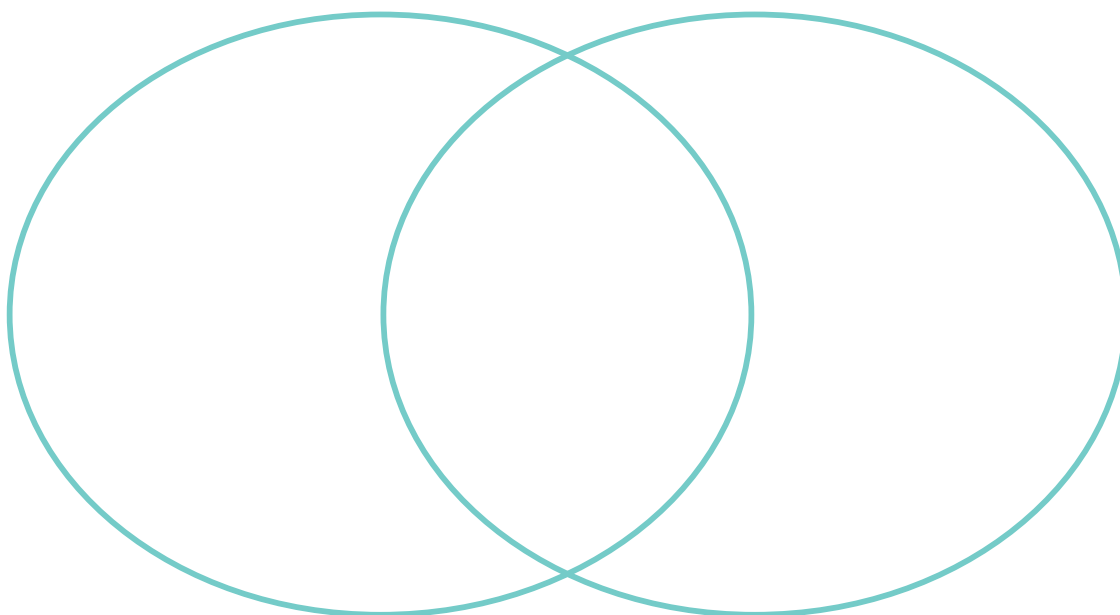
17. Suppose a cell's Golgi apparatus does not function properly. How might this problem affect other cells?

Organelles That Capture and Release Energy

18. Complete the Venn diagram to compare and contrast chloroplasts and mitochondria.

Chloroplasts

Mitochondria



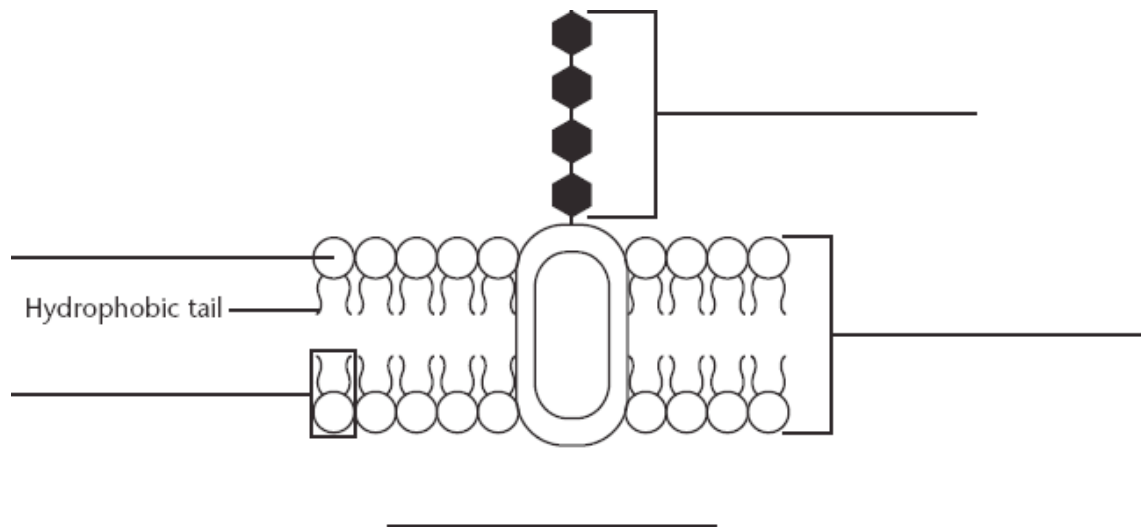
For Questions 19–22, write *True* if the statement is true. If the statement is false, change the underlined word or words to make the statement true.

- _____ 19. Chloroplasts are never found in animal cells.
- _____ 20. Unlike chloroplasts, mitochondria are surrounded by a double membrane.
- _____ 21. Nearly all of the mitochondria in your cells were inherited from your mother.
- _____ 22. Both chloroplasts and mitochondria lack genetic information in the form of DNA.

Cellular Boundaries

For Questions 23–25, complete each statement by writing the correct word or words.

23. Most cell _____ are porous to water and other materials but strong enough to support and protect cells.
24. Nearly all of the plant tissue called _____ is made up of cell walls.
25. Besides supporting and protecting a cell, the cell membrane _____ what enters and leaves the cell.
26. Complete the diagram of a section of a cell membrane. Then, on the line below the diagram, write the name of the model that describes the cell membrane's structure.



Apply the Big idea

27. What is the function of vesicles in the synthesis of proteins and the release of those proteins outside the cell?
